

Quarterly Report
January 1, 2005 to March 31, 2005

Project Title

Warm Water Species Fish Passage in Eastern Montana Culverts

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Introduction

This progress report covers work completed between January 1, 2005 and March 31, 2005. Work on the project during this period has been primarily devoted to site selection, equipment selections and development of experimental designs.

Project Objective

Culverts are a common and often the most cost effective means of providing transportation intersections with naturally occurring streams or rivers. Fish passage and fish habitat considerations are now typical components of the planning and design of waterway crossings. Many culverts in Montana span streams that support diverse fisheries. The health of these fisheries is an essential element of a recreational industry that draws hundreds of thousands of visitors to Montana annually. Additionally, there is growing recognition of the value of native Montana species, some of which are considered 'species of special concern' in the state. In recent years these concerns have become apparent for warm water species in low gradient, high sediment bearing, intermittently flowing streams that are typical of eastern Montana.

Transportation system planners, designers and managers recognize that fish passage through Montana's culverts is a concern. However, there is much contention concerning the impact that a culvert can have on a fishery. Recent basin-wide studies of various trout species that we conducted in western Montana indicate that the tools that some planners and designers promote for forecasting fish passage concerns may be overly conservative. Which species, life stages, and how many individuals must have fish passage access for how long, are questions that are often brought forward during discussions on the design and retrofitting of culverts to accommodate fish passage concerns. *The problem is that for warm water fish species and settings in eastern*

Montana, the timing and number of fish that must pass a culvert to maintain viable species diversity in the watershed is unknown, and the physiologic abilities of these species relative to such common fish passage questions are often unknown.

Progress

Study Sites A preliminary tour of eastern Montana was conducted February 22-24, 2005. Project personnel Loren Barber, Leo Rosenthal, Matt Blank were led by MDT personnel Larry Sickerson and Paul Sturm on a tour of approximately 40 different stream crossings at a variety of settings in Eastern Montana. Because of the severe drought conditions this part of the state is experiencing, sites were of higher priority for selection if they are known to have flowing water in them even in drier years. Three different streams were selected for this year's study: Beaver Creek, Crackerbox Creek, and Clear Creek (a few early-season photos of some culverts on these streams are shown below in Figures 1 and 2). Both Clear Creek and Crackerbox Creek are tributaries of the Yellowstone River, and Beaver Creek is a tributary of the Little Missouri River. Beaver Creek was selected for several reasons. First, Beaver Creek flows adequately year-round, and is known to have substantial populations of fish. Second, the stream contains numerous crossings, all of which are either bridges, or "Texas crossings" (low water fords with small culverts). Crackerbox and Clear Creek are parallel drainages that had acceptable flow rates during our preliminary investigations. These two streams were selected because of their unique situations regarding fish passage. Both have culvert crossings on the lower end that appear to have minimal passage implications, but upstream of these culverts both creeks flow under the highway using what may be substantial barriers to fish movement.



Figure 1. Texas crossing on Beaver Creek (l) and culverts on Clear Creek.



Figure 2. Culverts on Crackerbox creek under a County Road 109 (l) and I-94 (r).

Methods The mobility of the species of fish found in our study area is the primary focus of this study, so most of the methodology will address this question. Fish movement will be evaluated using a direct passage method. This will be accomplished by first designating control (no passage limitations) and experimental (culvert crossings) stream reaches. Fish will be collected upstream of the control reaches and upstream of the culverts, marked, and released downstream of either the culvert or a measured distance below the control segment. Fish will be collected via seining, and will be marked using Visual Implant Elastomer (VIE) tags. This method of tagging was selected because it is applicable to a variety of fish species and range of fish sizes, and has minimal impact on swimming capability. After the initial tagging, a sufficient amount of time will be allowed for the fish to move within the system. Then, fish will again be collected using seines, and the degree of movement will be recorded by examining marks on captured fish. An alternative to this post-marking collection technique might involve placing weir traps upstream of the control reaches and upstream of the culverts if site specifics are favorable. This method would ensure that fish movement was captured, but would require significant maintenance. Additionally, at each of the culverts, stilling wells with Tru-track data loggers will be installed to record water levels. This data will be used to create flow curves to compare fish passage versus discharge.

Equipment and Supplies A partial list of the equipment and supplies that are needed for the approach described above is as follows. Some of these can be borrowed from various sources at MSU, some will be purchased:

- Seines (2)
- Gurley velocimeter (1 set)
- stilling wells for Tru-track data loggers (7)
- Tru-track depth loggers (7)
- clove oil for anesthetizing fish
- 5 gallon buckets (4)
- fish measuring board (1)
- 4-Color VIE tagging kit from NW Marine Technology (1)

- auto-level kit (1)
- steel tape, pins, etc. (1 set)
- protective clothing (waders, mosquito net...) (2 sets)

Time Line Most of the species of warm water fish found in eastern Montana spawn in the spring (April/May), therefore this is the period of time we will be monitoring their movement. Due to the extraordinarily dry winter, and anticipated warm temperatures, spring runoff may occur earlier than normal this year, so our surveys will probably be moved more toward the last half of April rather than May. Communication with FWP Region 7 Fisheries Manager Brad Schmitz confirmed our decision, as he suggested there might be little water left by the end of May. Due to conflicts with class schedules, we anticipate using “long” weekends to get much of this work accomplished while school is in session. A possible schedule may be to collect and mark fish from Crackerbox and Clear Creek one weekend, then collect and mark the fish from Beaver Creek the following weekend. Then, on the third weekend, we would return to Crackerbox and Clear Creek to seine the upstream segments above both the control and experimental reaches to look for marked fish. On the fourth consecutive weekend, we would return to do the post-marking investigations at the Beaver Creek crossings. This schedule would allow fish 2 weeks to pass through the reaches. Ideally, a one-week period would have been used, but this schedule seems to be the most realistic considering the course loads of both research assistants. If post-marking collection involves the use of weir traps rather than seining, daily maintenance will be required.

Budget

Actual expenditures to date lag planned expenditures because of intentional delays in equipment and supplies purchases to better match the project needs with some site-specific conditions that have yet to be ascertained. Expenditures to date largely consist of graduate student stipends and tuition expenses, with some in-state travel to examine potential sites.

